

CLAIMS

What is claimed is:

1. A method of analysis of access list subsumption in routing devices of an actual or planned routed computer network, comprising:
producing structured data in electronic memory which includes respective stored router names and respective stored access lists which respectively include elements with address/mask pairs, and wherein said structured data associates respective access lists with respective router names;
determining whether respective access lists in the structured data include two or more elements in which a first element in the access list has a more general or equal address/mask pair than a second element in the access list, wherein the respective access lists are structured such that the first element is encountered prior to the second element during typical processing of the respective access lists; and
storing in electronic memory a report of access list elements in which a first element in the access list has a more general or equal address/mask pair than a second element in the access list.
2. The method of claim 1 wherein one or more of the respective stored access lists are respectively related to input packets and one or more of the respective stored access lists are respectively related to output packets and wherein the step of producing structured data is based at least in part on the respective stored access lists.
3. The method of claim 1 wherein each of the respective stored access lists is related to a respective level three protocol and wherein the step of producing structured data is based at least in part on the respective stored access lists.

1 4. The method of claim 3 wherein the respective level three protocol is one from a group
2 consisting of IP, IPX, and AppleTalk and wherein the step of producing structured data is
3 based at least in part on the respective stored access lists.

1 5. A method of identifying network integrity violations in a computer network, comprising:
2 producing structured data in electronic memory which includes respective stored router
3 names and respective stored access lists which respectively include patterns used
4 to filter data into and out of a routing device, and wherein said structured data
5 associates respective access lists with respective router names;
6 determining whether respective access lists in the structured data include a subsumption
7 relation in which a first pattern is more general than or equal to a second pattern,
8 wherein the respective access lists are structured such that the first pattern is
9 encountered prior to the second pattern during typical processing of the respective
10 access lists; and
11 storing in electronic memory a list of subsumption relations identifying respective pairs
12 of first and second patterns.

1 6. The method of claim 5 wherein one or more of the respective stored access lists are
2 respectively related to input packets and one or more of the respective stored access lists
3 are respectively related to output packets and wherein the step of producing structured
4 data is based at least in part on the respective stored access lists.

1 7. The method of claim 5 wherein each of the respective stored access lists is related to a
2 respective level three protocol and wherein the step of producing structured data is based
3 at least in part on the respective stored access lists.

1 8. The method of claim 7 wherein the respective level three protocol is one from a group
2 consisting of IP, IPX, and AppleTalk and wherein the step of producing structured data is
3 based at least in part on the respective stored access lists.

1 9. A computer-readable medium carrying one or more sequences of instructions for
2 analyzing access list subsumption in routing devices of an actual or planned routed
3 computer network, which instructions, when executed by one or more processors, cause
4 the one or more processors to carry out the steps of:

5 producing structured data in electronic memory which includes respective stored router

6 names and respective stored access lists which respectively include elements with
7 address/mask pairs, and wherein said structured data associates respective access
8 lists with respective router names;

9 determining whether respective access lists in the structured data include two or more
10 elements in which a first element in the access list has a more general or equal
11 address/mask pair than a second element in the access list, wherein the respective
12 access lists are structured such that the first element is encountered prior to the
13 second element during typical processing of the respective access lists; and

14 storing in electronic memory a report of access list elements in which a first element in
15 the access list has a more general or equal address/mask pair than a second
16 element in the access list.

1 10. The computer-readable medium of claim 9 wherein one or more of the respective stored
2 access lists are respectively related to input packets and one or more of the respective
3 stored access lists are respectively related to output packets and wherein the instructions
4 cause the one or more processors to carry out the step of producing structured data based
5 at least in part on the respective stored access lists.

1 11. The computer-readable medium of claim 9 wherein each of the respective stored access
2 lists is related to a respective level three protocol and wherein the instructions cause the
3 one or more processors to carry out the step of producing structured data based at least in
4 part on the respective stored access lists.

1 12. The computer-readable medium of claim 11 wherein the respective level three protocol is
2 one from a group consisting of IP, IPX, and AppleTalk and wherein the instructions
3 cause the one or more processors to carry out the step of producing structured data based
4 at least in part on the respective stored access lists.

1 13. A computer-readable medium carrying one or more sequences of instructions for
2 identifying network integrity violations in a computer network, which instructions, when
3 executed by one or more processors, cause the one or more processors to carry out the
4 steps of:
5 producing structured data in electronic memory which includes respective stored router
6 names and respective stored access lists which respectively include patterns used
7 to filter data into and out of a routing device, and wherein said structured data
8 associates respective access lists with respective router names;
9 determining whether respective access lists in the structured data include a subsumption
10 relation in which a first pattern is more general than or equal to a second pattern,
11 wherein the respective access lists are structured such that the first pattern is
12 encountered prior to the second pattern during typical processing of the respective
13 access lists; and
14 storing in electronic memory a list of subsumption relations identifying respective pairs
15 of first and second patterns.

1 14. The computer-readable medium of claim 13 wherein one or more of the respective stored
2 access lists are respectively related to input packets and one or more of the respective
3 stored access lists are respectively related to output packets and wherein the instructions
4 cause the one or more processors to carry out the step of producing structured data based
5 at least in part on the respective stored access lists.

1 15. The computer-readable medium of claim 13 wherein each of the respective stored access
2 lists is related to a respective level three protocol and wherein the instructions cause the
3 one or more processors to carry out the step of producing structured data based at least in
4 part on the respective stored access lists.

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16. The computer-readable medium of claim 15 wherein the respective level three protocol is
one from a group consisting of IP, IPX, and AppleTalk and wherein the instructions
cause the one or more processors to carry out the step of producing structured data based
at least in part on the respective stored access lists.

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17. An apparatus for analyzing access list subsumption in routing devices of an actual or
planned routed computer network, comprising:
3 means for producing structured data in electronic memory which includes respective
4 stored router names and respective stored access lists which respectively include
5 elements with address/mask pairs, and wherein said structured data associates
6 respective access lists with respective router names;
7 means for determining whether respective access lists in the structured data include two
8 or more elements in which a first element in the access list has a more general or
9 equal address/mask pair than a second element in the access list, wherein the
10 respective access lists are structured such that the first element is encountered

11 prior to the second element during typical processing of the respective access
12 lists; and
13 means for storing in electronic memory a report of access list elements in which a first
14 element in the access list has a more general or equal address/mask pair than a
15 second element in the access list.

1 18. An apparatus for identifying network integrity violations in a computer network,
2 comprising:
3 means for producing structured data in electronic memory which includes respective
4 stored router names and respective stored access lists which respectively include
5 patterns used to filter data into and out of a routing device, and wherein said
6 structured data associates respective access lists with respective router names;
7 means for determining whether respective access lists in the structured data include a
8 subsumption relation in which a first pattern is more general than or equal to a
9 second pattern, wherein the respective access lists are structured such that the first
10 pattern is encountered prior to the second pattern during typical processing of the
11 respective access lists; and
12 means for storing in electronic memory a list of subsumption relations identifying
13 respective pairs of first and second patterns.

1 19. An apparatus for analyzing access list subsumption in routing devices of an actual or
2 planned routed computer network, comprising:
3 a network interface coupled to the routed computer network for receiving one or more
4 packet flows therefrom;
5 a processor;

one or more stored sequences of instructions which, when executed by the processor,
cause the processor to carry out the steps of:

- producing structured data in electronic memory which includes respective stored
router names and respective stored access lists which respectively include
elements with address/mask pairs, and wherein said structured data
associates respective access lists with respective router names;
- determining whether respective access lists in the structured data include two or
more elements in which a first element in the access list has a more
general or equal address/mask pair than a second element in the access
list, wherein the respective access lists are structured such that the first
element is encountered prior to the second element during typical
processing of the respective access lists; and
- storing in electronic memory a report of access list elements in which a first
element in the access list has a more general or equal address/mask pair
than a second element in the access list.

20. An apparatus for identifying network integrity violations in a computer network,
comprising:
- a network interface coupled to the routed computer network for receiving one or more
packet flows therefrom;
 - a processor;
 - one or more stored sequences of instructions which, when executed by the processor,
cause the processor to carry out the steps of:
 - producing structured data in electronic memory which includes respective stored router
names and respective stored access lists which respectively include patterns used

10 to filter data into and out of a routing device, and wherein said structured data
11 associates respective access lists with respective router names;
12 determining whether respective access lists in the structured data include a subsumption
13 relation in which a first pattern is more general than or equal to a second pattern,
14 wherein the respective access lists are structured such that the first pattern is
15 encountered prior to the second pattern during typical processing of the respective
16 access lists; and
17 storing in electronic memory a list of subsumption relations identifying respective
18 pairs of first and second patterns.

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